

## **EXPLOSIVE CAPACITY DETERMINATION SYSTEM**

Since the inception of explosive constrained storage structures, the determination of the individual structures' capacities has been one of much labor intensive table look-ups and individual technical interpretation, and sometimes command interpretation.

In an attempt to simplify and automate, a computer system, which is a number of different computer subroutines, was developed for internal use and is being shown here. This program can help and assist all station explosives safety officers in reviewing all facility site approvals that involve facilities encumbered by or generating ESQD arcs to ensure that they comply with existing safety directions.

The computer system will, when provided all answers to a list of input questions about the distances to defined targets and building orientation, provide the structures' net explosive weight constraints for each hazard class and division along with maintaining a record of this in a data base file.

The system is connected/correlated to the sections, tables and figures of the Navy's Safety Regulations for Handling, Storing, Production, Renovation and Shipping, Ammunition and Explosives (NAVSEA OP-5), but should be applicable to any and all services' requirements.

The following provides the Guidelines for Use of the QDARC Program for the PC.

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## GUIDELINES FOR USE OF QDARC PROGRAM

All screens are simple to follow and events may be selected or entered by use of a mouse or through movement by arrow keys. Prompts at the end of each screen provide for continuation, exit or other prompt. The user may select or enter data applicable to a single magazine by selecting <single> at the bottom of screen 1 or may print a complete summary of all magazines listed on the data disk by selecting <all>.

At the C> prompt place the disk in drive A or B as appropriate.

Type A (or B):"install"

This will create a directory C:\qdarc on the C drive and enable the drive containing the disk to accept magazine data.

Type "qdarc" and press enter. This starts the screen entry process.

### Screen 1

Date and UIC fields are mandatory entries. Building measurement fields left blank as not applicable will default to the maximum allowable (design limit) net explosive weight. Magazine measurement data fields should be filled with "999999" if not an applicable entry.

1. Date - select date as furnished by the computer clock or correct the entry as necessary.
2. UIC - enter the station unit identification code.
3. Data drive - select the drive which contains the floppy disk.
4. Select <new> or <existing> to select whether data applies to a new magazine or is for revision to an existing magazine which is on the disk file.
5. Enter magazine number of the magazine (or if existing, select the magazine number from those displayed by pop-up screen).
6. Select <single> to continue with single magazine calculations.

**NOTE: Selection of <all mags> will print summary data entries for all magazines contained on the disk file under this UIC.**

**NOTE: All references to a "magazine" should be divided into the following descriptions: Host magazine is defined as the magazine being evaluated for establishment of Net Explosive Weight (NEW) limits to be set.**

**Target magazine - is defined as a magazine being considered as a Potential Explosive Site (PES) if within range of the host magazine.**

7. Enter (or verify) dimensions - Length x Width x Height in feet.

8. Select magazine type as applicable (igloo/box/etc).
9. Select type of magazine access as applicable (truck/rail/both).
10. Select magazine characteristics as appropriate. These entries include whether the magazine is standard, barricaded or earth-covered.

## **Screen 2**

11. Enter/verify maximum design limit Net Explosive Weight (NEW) as applicable for the magazine. These are contained in OP-5, Vol 1, Appendix C.
12. Enter distance to nearest inhabited building (in feet).
13. Enter building number of the inhabited building.
14. Enter description of the inhabited building.
15. Enter orientation of the inhabited building relative to the magazine as to whether it is to the front, side or rear of the host magazine.
16. Enter the distance to the nearest operations building (in feet).
17. Enter the building number of the operations building.
18. Enter the description of the operations building.
19. Enter the orientation of the operations building as to whether it is to the front, side or rear of the magazine.
20. Select barricaded or unbarricaded as appropriate for the operations building.
21. Enter distance to nearest public transportation route (in feet).
22. Enter description of the public transportation route.
23. Enter orientation of the public transportation route as to whether it is to the front, side or rear of the host magazine.
24. Enter distance to nearest airfield runway (in feet).
25. Select whether it is a DoD or non-DoD runway.

### Screen 3

26. Enter magazine number of the nearest earth covered magazine. (This will be designated as a target magazine)
27. Select whether it is a standard or non-standard magazine.
28. Select whether it is barricaded or unbarricaded.
29. Enter distance in feet to the target magazine.
30. Enter orientation of that magazine as to whether it is to the front, side or rear of the host magazine.
31. Enter orientation of the host magazine as to whether it is to the front, side or rear of the target magazine.
32. Enter the magazine number of the nearest above ground magazine. (This will be designated as a target magazine)
33. Select whether it is barricaded or unbarricaded.
34. Enter distance in feet to the target magazine.
35. Enter orientation of that magazine as to whether it is to the front, side, or rear of the host magazine.
36. Enter orientation of the host magazine relative to the target magazine, e.g. host magazine is to the front, side or rear of the target magazine.

**Note: When 2 earth covered magazines are sited so that one is in the forward sector of the other, a pop-up screen will appear requiring reference to the following for entry of a column number based on the orientation.**

(1) If, as shown in figure 7-1(a) and (b), the headwalls of magazines X and Y are outside the 120-degree sector, and therefore more than 60 degrees to either side of the centerline, they may be separated by the  $1.25W^{1/3}$  distances shown in **column 3**, calculated using the large quantity of Class/Division 1.1 stored in either. This is the equivalent of the standard magazine separation distance for igloos all facing the same direction with axes parallel.

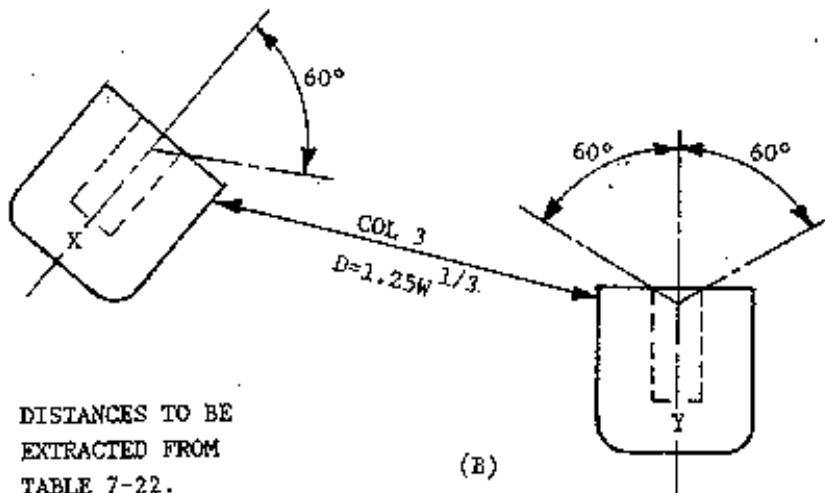
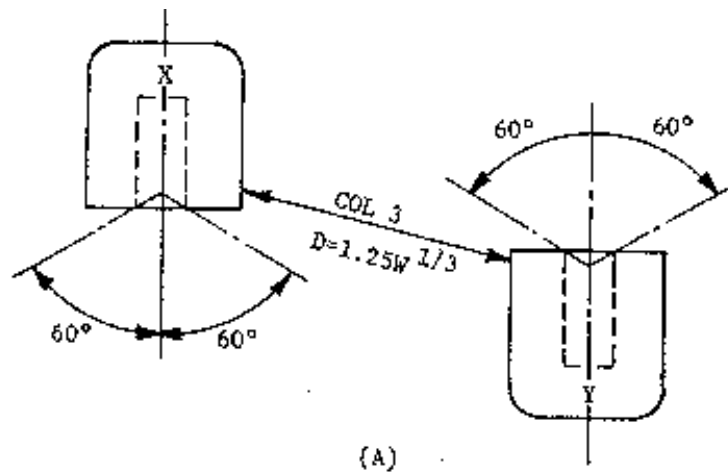
(2) If, as shown in figure 7-1(c), the headwall of X is outside the 120-degree sector of Y, but the headwall of Y is inside the 120-degree sector of X, the separation distance between these two igloos is determined by  $D=2.75W^{1/3}$  as shown in **column 5** based on the largest quantity of Class/Division 1.1 material in either igloo. For existing igloos originally cited at distances shown in **column 3**, this could result in an unnecessary limit on the contents of X.

(3) When the explosive quantities are comparable in X and Y, it is the exposure of igloo X to an explosion in Y that necessitates application of the  $2.75W^{1/3}$  distances shown in **column 5**. If the quantity in Y were reduced to less than one-tenth of that in X, or if the storage in Y is not Class/Division 1.1, the quantities in igloo X would control. The Q-D requirement shall then be taken from **column 3** or  $1.25W^{1/3}$ , and applied to the quantity in X. That is, the quantity in X would not need to be reduced. Therefore, basing the explosive limit in X upon **column 3** is not considered a deviation from the standard and does not require a waiver or exemption.

(4) If, as shown in figure 7-1(d), headwalls of X and Y are within the 120-degree sector of each other and are not provided with a separate door barricade, distances of  $D=11W^{1/3}$  shown in **column 11**, shall be used. If one or more separate door barricades are present that meet requirements for barricades, then the  $6W^{1/3}$  distance shown in **column 9** may be used to determine separation distances.

(5) Although in figure 7-1(c) no separate barricade is shown between X and Y, a more detailed analysis of a specific storage condition of this type might show that the distribution of explosives within X and Y is such that the earth fill of one or both meets the specifications of an effective barricade. In this case, the  $6W^{1/3}$  distance shown in **column 9** would apply.

(6) If, as shown in figure 7-1(e) and (f), igloos X and Y are either of a significantly different length of "canted" so that one of them is within the 120-degree sector off the headwall of the other, even though a straight line between headwall X and igloo Y passes through the earth cover of Y, the limit for X when X is the PES, would be based upon  $1.25W^{1/3}$  shown in **column 3**. If Y is the PES, however, the limit for Y would be determined by  $2.75W^{1/3}$  shown in **column 5**. Igloo Y may be used to its physical capacity for hazard divisions other than 1.1.



NOTE: DISTANCES TO BE  
EXTRACTED FROM  
TABLE 7-22.

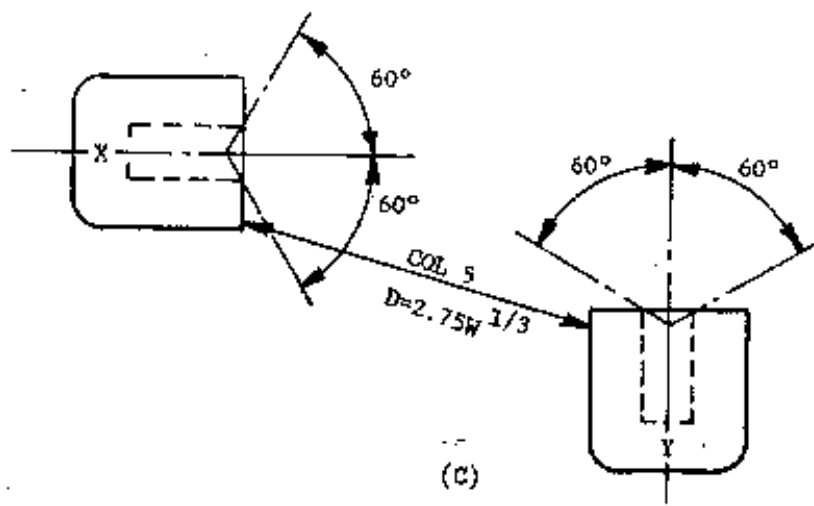
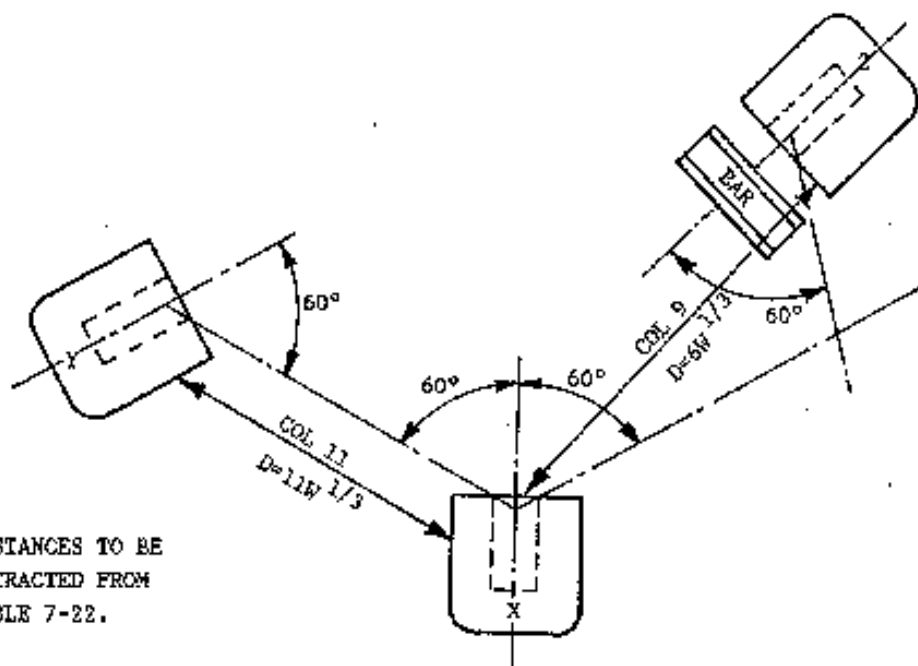
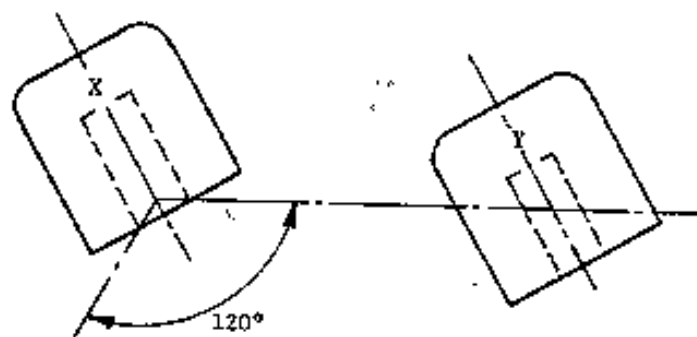


Figure 7-1. Quantity-Distance Requirements Based on Magazine Siting (1 of 3)

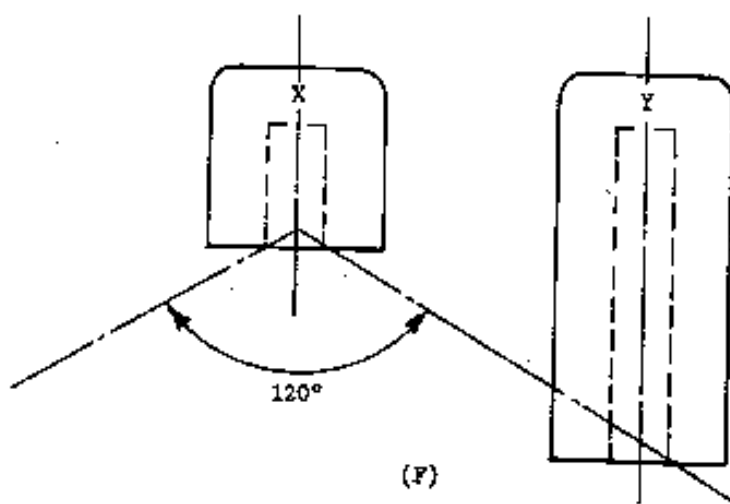
NOTE: DISTANCES TO BE  
EXTRACTED FROM  
TABLE 7-22.



(D)



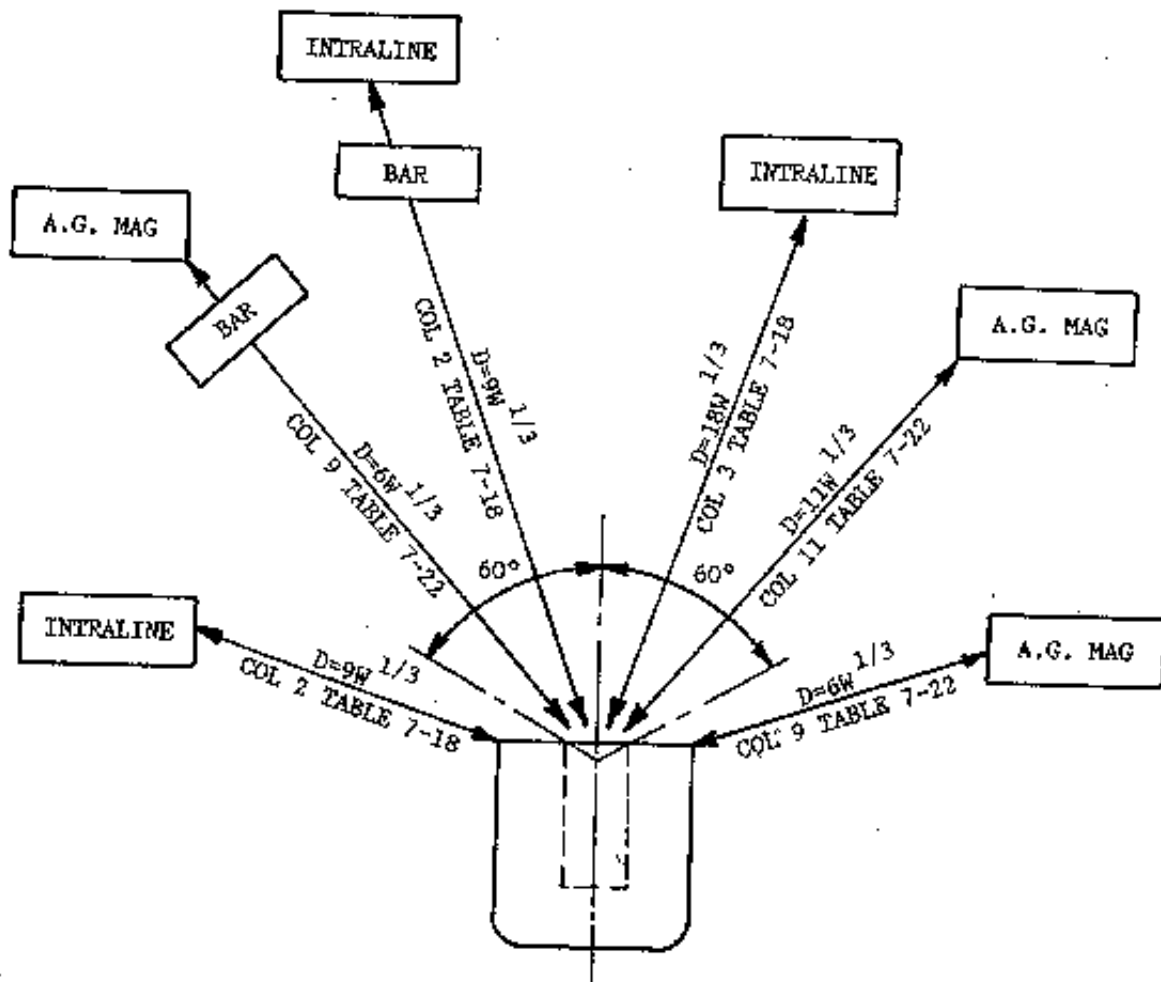
(E)



(F)

Figure 7-1. Quantity-Distance Requirements Based on Magazine Siting (2 of 3)





(G)

A.G. MAG - ABOVEGROUND MAGAZINE

BAR - BARRICADE

Figure 7-1. Quantity-Distance Requirements Based on Magazine Siting (3 of 3)

Select <view> to display the completed form on the screen.

Select <print> to print the completed form.

Select <save> to save and store the results on the floppy disk

Select <exit> which returns the user to screen 1 from which you may continue with another magazine, print an all magazine summary or exit the program.

You may use any or all of these functions as selected.